Research Note

Gastrointestinal Nematodes of the Cuban Treefrog, *Osteopilus septentrionalis* (Hylidae) from San Salvador Island, Bahamas

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ABSTRACT: The gastrointestinal tracts of 72 *Osteopilus septentrionalis* were examined for helminths. Five nematode species were present: *Oswaldocruzia lenteixeirai, Parapharyngodon osteopili, Physalopteroides bahamensis,* an unidentified female strongylid, and an unidentified larval oxyurid. *Physalopteroides bahamensis* had the greatest prevalence (83%) and highest mean intensity (8.4). This represents the first report of *O. lenteixeirai* and *P. osteopili* in the Bahamas.

KEY WORDS: Hylidae, *Osteopilus septentrionalis,* Nematoda, *Oswaldocruzia lenteixeirai, Parapharyngodon osteopili, Physalopteroides bahamensis,* Bahamas, prevalence.

The Cuban treefrog, *Osteopilus septentrionalis* Duméril and Bibron, 1841 is known from Cuba, the Bahamas, and Cayman Islands and has been introduced in Puerto Rico, St. Croix, St. Thomas, Florida Keys, and mainland Florida (Schwartz and Henderson, 1991). It is widespread but occurs primarily in mesic habitats. To our knowledge, there are 7 previous reports of nematodes from *O. septentrionalis*: Walton, 1940; Barus, 1973; Coy Otero et al., 1980; Adamson, 1981; Coy Otero and Barus, 1982; Coy Otero and Ventosa, 1984, Bursey and Goldberg, 1994. The purpose of this note is to report the gastrointestinal helminths of *O. septentrionalis* from San Salvador Island, Bahamas as part of an ongoing study of the biogeography of helminths in the Caribbean herpetofauna.

Seventy-two *O. septentrionalis* (mean snout–vent length, SVL = 48 mm ± 5.7 SD range 41–66) were hand collected and fixed in 10% formalin at the Bahamian Field Station (24°07′N, 74°28′W, 0 m elevation), San Salvador Island, Bahamas, 7–10 June 1991. The abdominal wall was slit to allow rapid penetration of fixative into the internal organs. Males were more abundant (*N* = 63) and smaller (mean SVL = 47 mm ± 3.1 SD, range 41–53 mm) than females (*N* = 9; mean SVL = 60 mm ± 5.6 SD, range 52–66 mm). The specimens were deposited in the herpetology collection of the Natural History Mu-

seum of Los Angeles County (LACM 139733–139804).

The body cavity was opened by a longitudinal incision from throat to vent, and the gastrointestinal tract was removed by cutting across the anterior esophagus and the rectum. The esophagus, stomach, small intestine, and large intestine were examined separately under a dissecting microscope. Recovered helminths were removed and identified utilizing the standard glycerol wet mount procedure.

Three species of nematodes, *Oswaldocruzia lenteixeirai* Pérez Vigueras, 1938, *Parapharyngodon osteopili* Adamson, 1981, and *Physalopteroides bahamensis* Bursey and Goldberg, 1994, were recovered and identified. In addition, 1 gravid female strongylid and 1 larval oxyurid were found but not identified. The female strongylid was 1.75 mm long × 0.046 mm wide, measured at the vulva, which was equatorial in placement. The body was alate throughout its length. The uteri were amphidelphic. The eggs formed a single row within the uterus and measured 30 μm × 40 μm; they were barrel-shaped within the uterus but became oval when released. Because no males were found, identification was not attempted. The esophagus of the larva was typical of oxyurid nematodes, containing a corpus, isthmus, and bulb; a digitiform tail was present. Again, identification was not attempted. Of the nematodes reported here, *P. bahamensis* had the highest prevalence and mean intensity (Table 1). *Physalopteroides bahamensis* was originally described from *O. septentrionalis* from the Bahamas (Bursey and Goldberg, 1994). This is the first report of *O. lenteixeirai* and *P. osteopili* in the Bahamas. Selected specimens were placed in vials of alcohol and deposited in the USNM Helminthological Collection, USDA, Beltsville, Maryland 20705: *O. lenteixeirai* (82786); *P. osteopili* (82784); *P. bahamensis* (82785); female strongylid (82788); oxyurid larva (82787).

Table 1. Prevalence, mean intensity (range), and location of nematodes from 72 *Osteopilus septentrionalis* from San Salvador Island, Bahamas.

Parasite	Prevalence (number infected/ number examined, %)	Mean intensity (range)	Location*
Oswaldocruzia lenteixeirai	31	3.8 (1–25)	b, c
Parapharyngodon osteopili	79	5.8 (1–24)	c, d
Physalopteroides bahamensis	83	8.4 (1–31)	a, b, c, d
Unidentified oxyurid	1	1.0	d
Unidentified strongylid	1	1.0	c

* a = Esophagus, b = stomach, c = small intestine, and d = large intestine.

The 12 nematode species previously recorded for *O. septentrionalis* are listed in Table 2. *Oswaldocruzia lenteixeirai* is known from 17 species of amphibians and 22 species of reptiles from Cuba and has also been reported from Puerto Rico (see Baker, 1987). The prevalence we report here for *O. lenteixeirai* is similar to that reported previously by Coy Otero and Ventosa (1984). *Parapharyngodon osteopili* is known only from Cuba and from a single *O. septentrionalis* as reported by Adamson (1981). Our findings extend the range of these 2 species to the Bahamas. *Physalopteroides bahamensis* is known only from San Salvador Island, Bahamas. It is differentiated from the closely related *Physalopteroides valdesi,* reported only from Cuba where it occurs in 2 eleutherodactylid frogs and an anole (Baker, 1987), by the distribution of caudal papillae (*P. bahamensis* has 8 precloacal, 2 paracloacal, 8 postcloacal; *P. valdesi* has 10 precloacal, 2 paracloacal, 6 postcloacal) and spicule size and form (the spicules of *P. bahamensis* are unequal in size and form and are approximately one-half the length of the equal spicules of *P. valdesi*). In addition, *P. bahamensis* is roughly twice the length of *P. valdesi.*

The other nematodes reported from *O. septentrionalis* may occur at such low prevalences (Table 2) that our sample size might not account for them. Alternatively, there may be some aspect of the biogeography of these helminths that prevents their occurrence in *O. septentrionalis* in the Bahamas. For example, *Batracholandros bassi* is currently known only from Cuba but has been found in 15 species of frogs (Barus, 1973; Coy Otero and Ventosa, 1984). Its life cycle is apparently unknown, although we would expect a typical oxyurid life cycle with direct infection by ingestion of eggs (Anderson, 1992). We did recover a larval oxyurid; the prevalence was similar to that reported by Coy Otero and Ventosa (1984) for unidentified larval oxyurids in *O. septentrionalis* from Cuba.

Cosmocercoids are parasites of the intestine of amphibians and reptiles (Anderson, 1992). Females of *Aplectana* spp. produce larvated eggs that hatch outside the host to develop into infective third-stage larvae with the final host becoming orally infected (Anderson, 1992). With the exception of Cuba, species of *Aplectana* are unknown from Caribbean islands. *Hammerschmidtiella diesingi,* a parasite of cockroaches (Coy Otero et al., 1980), apparently represents an incidental occurrence resulting from ingestion with prey and is not typically found in *O. septentrionalis.*

The definitive hosts of species from the anisakid genus *Contracecum* are piscivorous birds and mammals (Anderson, 1992). Unembryonated eggs pass out in the feces of the host. Subsequent development and hatching as second-stage larvae occur in water. Larvae are ingested by a wide variety of invertebrate hosts especially copepods (see Norris and Overstreet, 1976), which in turn are fed upon by fish. Larvae are thought to pass from 1 fish intermediate host to another through predation and reinvasion of tissues of the new host.

Species from the ascarid genus *Porrocaecum* are widely distributed parasites of the intestine of birds (Anderson, 1992). Eggs hatch after ingestion by earthworms; a large number of earthworm species are known as intermediate hosts (see Supriaga, 1972). Shrews and other small mammals that consume earthworms act as paratenic hosts, capable of transferring *Porrocaecum* to definitive carnivorous bird hosts; species in birds that do not consume small mammals are infected directly from ingesting earthworms (Anderson, 1992).

Table 2. Previously reported nematodes of *Osteopilus septentrionalis*.

Parasite	Prevalence (number infected/ number examined, %)	Mean intensity (range)	Site*	Locality	Reference
Dioctophymatoidea					
Eustrongylides sp. (larvae)	Not given	Not given	—	Cuba	Walton, 1940
Oxyuroidea					
Batracholandros bassi	Not given	Not given	d	Cuba	Walton, 1940
	33 (4/12)	Not given (7–50)	d	Cuba	Barus and Moravec, 1967
	56 (98/175)	8.0 (not given)	d	Cuba	Coy Otero and Ventosa, 1984
Parapharyngodon osteopili	100 (1/1)	43.0	d	Cuba	Adamson, 1981
Larval oxyurids	1 (1/175)	17.0 (not given)	b	Cuba	Coy Otero and Ventosa, 1984
Cosmocercoidea					
Aplectana sp.	1 (1/175)	3.0 (not given)	d	Cuba	Coy Otero and Ventosa, 1984
Aplectana hamatospicula	2 (3/175)	3.6 (not given)	d	Cuba	Coy Otero and Ventosa, 1984
Hammerschmidtiella diesingi	100 (1/1)	19.0	b	Cuba	Coy Otero et al., 1980
Ascaridoidea					
Contracaecum sp. (larvae)	1 (1/175)	6.0 (not given)	b	Cuba	Coy Otero and Ventosa, 1984
Porrocaecum sp. (larvae)	2 (3/175)	2.3 (not given)	b	Cuba	Coy Otero and Ventosa, 1984
Physalopteroidea					
Abbreviata sp. (larvae)	2 (3/175)	1.7 (not given)	b	Cuba	Coy Otero and Ventosa, 1984
Physalopteroides valdesi	1 (2/175)	2.0 (not given)	b	Cuba	Coy Otero and Ventosa, 1984
Filarioidea					
Foleyellides brachyoptera	1 (1/175)	4.0 (not given)	e	Cuba	Coy Otero and Ventosa, 1984
Trichostrongyloidea					
Oswaldocruzia lenteixeirai	58 (7/12)	Not given (1–15)	b, c	Cuba	Barus and Moravec, 1967
	34 (59/175)	2.5 (not given)	c	Cuba	Coy Otero and Ventosa, 1984

* a = Esophagus, b = stomach, c = small intestine, d = large intestine, and e = body cavity.

Likewise, piscivorous birds (Chitwood, 1969) are the definitive hosts for the dioctophymatid genus *Eustrongylides*. Freshwater oligochaetes are thought to be the first intermediate host and fish are assumed to be the second intermediate host, although numerous paratenic hosts have been identified (see Bursey, 1986). *Osteopilus septentrionalis* apparently can serve as a paratenic host for these nematodes.

Physalopterids occur mainly in the stomach of reptiles, birds, and mammals; rarely in amphibians and fishes (Anderson, 1992). Only larval *Abbreviata* sp. are known from *O. septentrionalis* (Table 2). *Abbreviata ranae* was described from larvae recovered from amphibians (*Rana catesbeiana, Rana utricularia sphenocephala, Bufo woodhousii, Hyla cinerea*) of North America and has been reported by a number of authors, but is considered by Baker (1987) to be a species inquirenda and may, in fact, represent more than

1 physalopterid species. Larval physalopterids, but not adults, are frequently encountered in frogs, toads, salamanders, and a few species of lizards (Goldberg et al., 1993). Because insects serve as intermediate hosts, diet may be important in the initial infection; however, some internal mechanism may produce an unfavorable environment that prevents survival to adult stage (Goldberg et al., 1993). Because these physalopterids do not occur in cysts and are apparently short lived, we do not consider the herptiles in which they are found to be paratenic hosts.

Species of the genus *Folleyellides* are parasites of amphibians (Baker, 1987). *Folleyellides brachyoptera* is known only from North America (*R. utricularia sphenocephala*) and Cuba (*Peltaphryne peltacephala, O. septentrionalis*) (see Baker, 1987). Larval stages develop in mosquitos (Causey, 1939). The factors responsible for the distribution of nematodes among different is-

land/mainland amphibian populations have not been elucidated and warrant subsequent investigation.

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